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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/814,592	03/31/2004	Kevin P. O'Brien	110348-135100	5877

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EXAMINER

BERRY, RENEE R

ART UNIT

PAPER NUMBER

2891

DATE MAILED: 03/23/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

N.A

Office Action Summary	Application No. 10/814,592	Applicant(s) O'BRIEN ET AL	
	Examiner Renee R. Berry	Art Unit 2829	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-23 is/are pending in the application.
 4a) Of the above claim(s) 10-23 is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-9 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 31 March 2004 is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|--|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input checked="" type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. <u>3-3-2005</u> |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>8/23/04</u> . <u>6/28/04</u> . | 6) <input type="checkbox"/> Other: ____. |

DETAILED ACTION

Election/Restrictions

Restriction to one of the following inventions is required under 35 U.S.C. 121:

- I. Claims 1-9 are, drawn to a method of depositing a cobalt capping layer, classified in class 438, subclass 500+.
- II. Claims 10-20 are, drawn to an apparatus, classified in class 118, subclass 500+.
- III. Claims 21-23 are, drawn to a system, classified in class 257, subclass 500+

The inventions are distinct, each from the other because of the following reasons:

Inventions I and II are related as process and apparatus for its practice. The inventions are distinct if it can be shown that either: (1) the process as claimed can be practiced by another materially different apparatus or by hand, or (2) the apparatus as claimed can be used to practice another and materially different process. (MPEP § 806.05(e)). In this case the apparatus as claimed can be used to practice another and materially different process, such as etching.

Inventions II and III are related as apparatus and product made. The inventions in this relationship are distinct if either or both of the following can be shown: (1) that the apparatus as claimed is not an obvious apparatus for making the product and the apparatus can be used for making a different product or (2) that the product as claimed can be made by another and materially different apparatus (MPEP § 806.05(g)). In this case the apparatus as claimed is not an obvious apparatus for making the product and

the apparatus can be used for making a different product, such as capacitor, DRAM, SRAM, EPROM, MOSFET.

Inventions I and III are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case the product/system as claimed can be made by another and materially different process, such as electrolytic plating, MOCVD, or sputtering.

Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

During a telephone conversation with Aloysius AuYeung on March 3, 2005 a provisional election was made without traverse to prosecute the invention of Group I, claims 1-9. Affirmation of this election must be made by applicant in replying to this Office action. Claims 10-23 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent No. 6,777,807 to Sukharev et al. in view of US Patent No. 6,165,912 to McConnell et al.

In regards to claim 1, Sukharev teaches a method comprising providing a wafer comprising a plurality of copper structures partially encased in an interlayer dielectric layer (Figure 4, reference # 16-copper and #14-dielectric interlayer, column 3, lines 59-62), where top surfaces of the copper structures are exposed and substantially coplanar with a top surface of the interlayer dielectric layer; and selectively depositing a cobalt capping layer on the top surfaces of the plurality of copper structures with substantially no deposition of the cobalt on the top surface of the interlayer dielectric layer (Figure 4, reference #20, column 4, lines 40-45), using an aqueous electro-less bath (column 4, lines 41-45).

In regards to claim 6, Sukharev teaches a method comprising providing a wafer comprising a plurality of copper structures partially encased in an interlayer dielectric layer, where top surfaces of the copper structures are exposed and substantially coplanar with a top surface of the interlayer dielectric layer (Figure 4, reference # 16-

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copper and #14-dielectric interlayer, column 3, lines 59-62); selectively depositing a cobalt capping layer on the top surfaces of the plurality of copper structures (Figure 4, reference #20, column 4, lines 40-45).

However, Sukharev does not teach all the limitations of the following claims:

In regards to claims 1 and 2, McConnell teaches the method of claim 1, wherein the applying of sonic energy comprises applying a selected one of mega and ultra sonic energy at column 12, lines 5-10.

In regards to claim 3, McConnell teaches the method of claim 1, wherein the applying of sonic energy comprises applying the sonic energy at a frequency range of 10 to 1200 kilohertz at column 12, lines 5-10.

In regards to claims 5 and 6, McConnell teaches the method of claim 1, wherein the method further comprises simultaneously rinsing and applying sonic energy to the hydrophobic interlayer dielectric layer after said selective deposition of cobalt at column 15, lines 50-54.

In regards to claim 7, McConnell teaches the method of claim 6, wherein the applying of sonic energy comprises applying a selected one of mega and ultra sonic energy at column 12, lines 5-10.

In regards to claim 8, McConnell teaches the method of claim 6, wherein the applying of sonic energy comprises applying the sonic energy at a frequency range of 10 to 1200 kilohertz at column 12, lines 5-10.

Therefore, it would have been obvious to one having ordinary skill in the art to have modified Sukharev to include applying of sonic energy comprises applying a

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selected one of mega and ultra sonic energy; and applying of sonic energy comprises applying the sonic energy at a frequency range of 10 to 1200 kilohertz, since such a modification would result in more uniform deposition results, the removal of unwanted particles, the dislodging of unwanted gas bubbles and overcoming mass transfer limitations, as described in column 12, lines 14-16.

In regards to claim 4, McConnell teaches the method of claim 1, wherein the applying of sonic energy comprises applying the sonic energy at column 12, lines 5-10.

In regards to claim 9, McConnell teaches the method of claim 6, wherein the applying of sonic energy comprises applying the sonic energy at column 12, lines 5-20.

Regarding claims 4 and 9, while McConnell teaches that sonic energy may be employed to improve a cobalt metal deposition process, the reference does not expressly state the power levels used. Nonetheless, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have set the power level to be within the claimed range of 1-5 watts/cm², because McConnell teaches the general conditions. Therefore, a power level would necessarily have to be used and the power level ultimately decided upon would merely constitute an obvious optimization obtainable through routine experimentation.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Renee R. Berry whose telephone number is (571) 272-1774. The examiner can normally be reached on M-F 9-5:30.

The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



RRB
March 3, 2005



**B. WILLIAM BAUMEISTER
SUPERVISORY PATENT EXAMINER**